REMARKS

The Examiner is thanked for the courtesy extended to Applicants' attorneys Benjamin Bai and Janet Garetto during a brief telephone interview with Examiners Bernatz and Resan on May 24, 2001. During the interview, the Examiners clarified the rejections set forth in the Office Action, and Applicants' attorneys discussed the pending claims, proposed claim amendments, and amendments to the specification to correct the informalities noted in the Office Action.

Claims 1-46 are pending in the application. Applicants confirm that claims 38-46 have been withdrawn without prejudice in view of the restriction requirement. Remaining claims 1-37 have been rejected or objected to. Claims 1-12, 14-26, 29-30, 33, and 35 have been amended to clarify the invention. Support for these amendments can be found, for example, on page 19. No new matter has been introduced.

OBJECTION TO SPECIFICATION

The Applicants have corrected numerous informalities in the specification, including replacing "Al_2O_3" with --Al_2O_3-- on page 4, line 11 as noted in the Office Action. No new matter has been introduced. Accordingly, Applicants respectfully request that this objection be withdrawn.

CLAIM OBJECTIONS

The Applicants have corrected the informality noted in Claim 11 by inserting the subscript "n" on the cyclopentane. The objection to Claims 38-46 is deemed to be moot in view of the withdrawal of claims 38-46 without prejudice from this application in view of the restriction requirement. Accordingly, Applicants respectfully request that this objection be withdrawn.

CLAIM REJECTIONS UNDER 35 U.S.C. 112

The Applicants have amended the claims by deleting the term "derivatives." Accordingly, Applicants respectfully request that this rejection be withdrawn.

CLAIM REJECTIONS UNDER 35 U.S.C. 102(b)

JP Patent No. 58222441 A ("MATU")

Claims 1-12 and 26-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsushita Elec. Co. Ltd. (JP Patent No. 58222441 A) ("MATU"). In making this rejection, the Examiner states the following:

> Regarding claims 1-3 and 26-30, the claimed invention reads on MATU as follows: MATU disclose a magnetic recording medium comprising a non-magnetic support, a magnetic layer formed on the support and a lubricant layer over the magnetic layer, wherein the lubricant layer includes a compound selected from the group consisting of hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, hydrocarbyl-substituted cyclopentadiene, and mixtures and derivatives thereof (e.g. unsaturated alicyclic compounds including a positive recitation of cyclopentadiene) (abstract).
>
> The disclosed material (cyclopentadiene) reads on applicants' claims because m and n of claims 2 and 3 can be 0, leading to a "hydrocarbyl-substituted" cyclopentadiene composed of only cyclopentadiene.
>
> The added limitations in claims 26-29 are nominal apparatus claims ane were given no weight in patentability since the apparatus elements recited are old in the art. The added limitations in claim 30 are nominal method steps and were given no weight in patentability. The applicant is reminded that amendment to include positive recitation of non-nominal apparatus elements or method steps can result in restriction by original presentation.
>
> Regarding claims 4-12, the added limitations of these dependent claims are directed to derivatives that are a certain subclass of polar modified cyclo(pentane, pentene, pentadiene)s. However, the claims as written do not require that the lubricant layers of claims 4-12 actually consist of these derivatives. Since claims 4-12 incorporate all the limitations of parent claim 1, the lubricant layer still need only be selected from the group consisting of "hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, hydrocarbyl-substituted cyclopentadiene, and mixtures or derivatives thereof", so the 'hydrocarbyl-substituted' cyclopentadiene of MATU meets the limitation of the Markush group of claims 4-12. Suggested rewording would be to amend claim 4 to "wherein said lubricant layer is a [the] derivative[s] of the ... cyclopentadiene and includes at least...".

Office Action of March 12, 2001, pages 4-6.

Applicants have translated MATU and are submitting the translation in an information disclosure statement. For the Examiner's convenience, a copy of the translated MATU reference is attached as Appendix C to this response. Applicants have reviewed MATU and respectfully disagree that it anticipates presently pending claims 1-12 and 26-30. It is well established that, to constitute anticipation, a prior art reference must disclose each and every element of a claim at issue. Applicants respectfully submit that MATU does not teach all the limitations recited in

claims 1-12 and 26-30.

Claims 1-12 are directed to a magnetic recording medium comprising a non-magnetic support, a magnetic layer, and a lubricant layer which includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Claims 26-28 are directed to a data storage/retrieval device which includes a lubricant layer having a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Claim 29 is directed to a computer which includes a lubricant layer having a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Claim 30 is directed to a method of manufacturing a magnetic recording medium which includes the step of forming a lubricant layer over a magnetic layer where the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Common to presently pending claims 1-12 and 26-30 is the recitation that the lubricant layer include a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. MATU does not teach this limitation.

The definition of hydrocarbyl substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, and hydrocarbyl-substituted cyclopentadienes is set forth on page 7 of the patent application which is reproduced as follows:

> Although "hydrocarbyl" is generally understood to mean an organic group that includes only carbon and hydrogen, the term is used herein to refer to both functionalized hydrocarbyl and non-functionalized hydrocarbyl. Functionalized hydrocarbyl refers to an organic group that includes carbon, hydrogen, and a functional group (e.g., a polar group), whereas non-functionalized hydrocarbyl refers to an organic group that includes only carbon and hydrogen. A derivative of a hydrocarbyl-substituted cyclopentane refers herein to any compound that is derived from the hydrocarbyl-substituted cyclopentane. Derivation may occur on the hydrocarbyl or the cyclopentane group. Preferably, derivation should occur on one or more of the hydrocarbyl groups by introducing one or more polar groups. The derivation may be achieved either before or after the hydrocarbyl-substituted cyclopentane is prepared. A derivative of hydrocarbyl-substituted cyclopentadienes and hydrocarbyl-substituted cyclopentenes is similarly defined herein.

Specification, page 7, lines 2-13.

MATU discloses a magnetic recording medium having "a strong magnetic metallic film including oxygen" which is "formed on a non-magnetic substrate" and a "corrosion preventing agent having as the main component unsaturated aliphatic and alicyclic compounds" which are "attached by bonding to said strong magnetic metallic film." MATU, pages 1-2. Examples of unsaturated aliphatic and alicyclic compounds suitable for use in the MATU magnetic recording medium are provided on page 3 and in the table on page 5 of MATU. The table on page 5 of MATU discloses the use of unsubstituted cyclopentadiene as a corrosion preventing agent in the magnetic recording medium. However, nowhere in MATU is there disclosed the presently claimed hydrocarbyl substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, or hydrocarbyl-substituted cyclopentadienes. Since MATU does not disclose the presently claimed hydrocarbyl substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, or hydrocarbyl-substituted cyclopentadienes, Applicants respectfully submit that MATU does not anticipate claims 1-12 or 26-30 of the claimed invention.

U.S. Patent No. 5,525,392 to Baum et al. ("Baum")

Claims 1-31 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 5,525,392 to Baum et al. ("Baum"). In making this rejection, the Examiner states the following:

> Regarding claims 1-3, 14, 15 and 25-30, the claimed invention reads on Baum et al. as follows: Baum et al. discloses a magnetic recording medium comprising a non-magnetic support, a magnetic layer formed on the support and a lubricant layer over the magnetic layer (col. 1, lines 22-31), wherein the lubricant layer includes a compound selected from the group consisting of hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, hydrocarbyl-substituted cyclopentadiene, and mixtures or derivatives thereof (e.g. cyclopentane) (col. 3, lines 54-67).
>
> The disclosed material (cyclopentane) reads on applicants' claims because m and n of claims 2, 3, 14 and 15 can be 0, as explained above in paragraph 8.
>
> Regarding claims 13 and 31, Baum et al. discloses an optional protective layer (col. 1, lines 22-31).
>
> Regarding claim 25, Baum et al. discloses that it is old in the art to place a lubricant layer on a magnetic head (col. 7, lines 15-17).
>
> The added limitations in claims 26-30 were given no weight in patentability for the reasons cited above (paragraph 8).
>
> Regarding claims 4-12 and 16-24, the added limitations of these dependent claims are not required because of the wording of the claims (see paragraph 8).

Office Action of March 12, 2001, pages 6-7.

Applicants have reviewed Baum and respectfully disagree that it anticipates presently pending claims 1-31. It is well established that, to constitute anticipation, a prior art reference must disclose each and every element of a claim at issue. Applicants respectfully submit that Baum does not teach all the limitations recited in presently pending claims 1-31.

Claims 1-25 are directed to a magnetic recording medium comprising a non-magnetic support, a magnetic layer, and a lubricant layer which includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Claims 26-28 are directed to a data storage/retrieval device which includes a lubricant layer having a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Claim 29 is directed to a computer which includes a lubricant layer having a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Claims 30-31 are directed to a method of manufacturing a magnetic recording medium which includes the step of forming a lubricant layer over a magnetic layer where the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Common to presently pending claims 1-31 is the recitation that the lubricant layer include a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. Baum does not teach this limitation.

Baum discloses a "process for coating a magnetic recording device with a polymeric film magnetic recording article with a lubricating polymeric film." Baum, column 2, lines 27-33. One of the steps involves "contacting the surface of the article" with a "beam of ions" and "precursor gas to form the polymeric film on the article." Baum, column 2, lines 27-33. Suitable precursor gases for use in this process include hydrocarbon gases and halocarbon gases. Baum, column 3, lines 50-52. A suitable hydrocarbon gas for use in the Baum process is an unsubstituted cyclopentane. Baum, column 3, lines 53-55. A suitable halocarbon gas for use in the Baum process is a perfluorocyclopentene. Baum, column 3, lines 57-65. However, nowhere in Baum is there disclosed the presently claimed hydrocarbyl substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, or hydrocarbyl-substituted cyclopentadienes as defined above. Since Baum does not disclose the presently claimed hydrocarbyl substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, or hydrocarbyl-substituted cyclopentadienes, Applicants respectfully

submit that Baum does not anticipate claims 1-31 of the claimed invention.

CLAIM REJECTIONS UNDER 35 U.S.C. 103(a)

Claims 1-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ng (U.S. Patent No. 5,128,216) ("Ng") in view of Venier and Casserly (Lubrication Engineering, Vol. 47, 7, 586-591, 1991) ("Venier Article") and further in view of Venier et al. (U.S. Patent No. 5,012,023) ("Venier Patent"). In making this rejection, the Examiner states the following:

> Regarding claims 1-12 and 14-24, Ng discloses a magnetic recording medium comprising a non-magnetic support, a magnetic layer formed on the support and a lubricant layer over the magnetic layer (background of invention). Ng discloses fluorinated lubricants wherein the lubricant includes a nucleus selected from a cycloaliphatic having from 4-8 ring carbon atoms) (col. 2, line 54 bridging col. 7, line 54; notably col. 4, lines 14-17).
>
> Ng fails to disclose using the exact hydrocarbyl-substituted cyclo(pentane, pentene, pentadiene) compounds as claimed by applicants. Ng does disclose the importance of having a nucleus consisting of a cycloaliphatic having from 4-8 ring carbon atoms (col. 4, lines 3-17), and further teaches the importance of adding polar groups, including phosphates, sulfates, amines, esters, carboxylic acids, etc. to improve the linking and bonding ability of the cycloaliphatic nucleus (col. 5, line 54 bridging col. 7, line 54 and col. 11, lines 44-63).
>
> However, Venier and Casserly teach that hydrocarbyl-substituted cyclopentanes are excellent lubricants and offer performance that is superior to fluorinated lubricants (page 590, section titled: 2-Octyldodecanol Derived Multiply-Alkylated Cyclopentane). Vernier et al. (023) further teach that hydrocarbyl-substituted cyclo)pentane, pentene, pentadiene) compounds are old in the art as lubricants and discloses structures meeting applicants' claimed limitations in claims 2 and 14.
>
> It would therefore have been obvious to one of the ordinary skill in the art at the time of the applicant's invention to modify the device of the Ng to include hydrocarbyl-substituted cyclo(pentane, pentene, pentadiene) compounds as taught by Venier and Casserly in view of Venier et al. (023) since these compounds offer performance that is superior to fluorinated lubricants.
>
> Regarding the limitations added in claims 3-12 and 15-24, the modification of hydrocarbyl-substituted cyclo(pentane, pentene, pentadiene) to include polar substituents is old in the art. Applicants admit that the method of making these compounds is old (page 9, lines 10-15) and the term "hydrocarbyl" is understood in the art to allow for functionalized hydrocarbyl groups (Hayashi, U.S. Patent 4,566,983, col. 2, line 40 bridging col. 3, line 30-reads on claims 3-5, 7-10, 12, 15-17, 19-22, and 24). For additional support that these compounds are old in the art, see also:
>
> - Enc. Chem. Tech. teaches structures that are old in the art for lubricants (reads on claims 3, 4, 6, 7, 15, 16, 18 and 19);
> - Venier and Casserly (IDS: Symposium on the Chem. of Lubricants, Boston Meeting, Pre-prints, Vol. 35#2, 1990) teach Diels-Alder functionalized lubricants (reads on claims 12 and 24);
> - Boatto et al. (IDS: II Farmaco, 48(9) 1993) teach

Diels-Alder functionalized lubricants (reads on claims 12 and 24);

- Frey et al. (U.S. Patent No. 5,578,741, col. 1, line 66 bridging col. 2, line 52) teach hydrocarbyl-substituted cyclopentadiene with phosphorus or nitrogen functionality (reads on claims 3, 4, 6, 8, 10, 15, 16, 18, 20 and 22);
- Emert et al. (U.S. Patent No. 5,578237, col. 10, lines 21-65) teach bridged cyclopentadienes with alkyene or amine radicals (reads on claims 3, 4, 8, 10, 11, 15, 16, 20, 22 and 23);
- Patsidis et al. (U.S. Patent No. 5,541,351, col. 2, line 19 bridging col. 3, line 22) teach bridged cyclopentadiene with alkene, amine or phosphorous radicals (reads on claims 3, 4, 6, 8, 10, 11, 15, 16., 18, 20, 22 and 23);
- Matsui et al. (U.S. Patent No. 5,310,439, col. 2, lines 20-28) teach substituting cyclopentadienes with functionalized hydro-carbyl groups containing polar compounds (reads on claims 3-5, 7, 8, 10, 11, 15-17, 19, 20, 22 and 23);
- Tsuchiya et al. (U.S. Patent No. 5,084,516, col. 1, line 51) teach improving the flowability of cyclopentadiene by adding hydrocarbyl groups functionalized with polar substituents (reads on claims 3-5, 7, 8, 10, 15-17, 19, 20, and 22; and
- Falcone (U.S. Patent No. 5,874,169, figures and col. 2 lines 56-62) teaches a high bonding lubricant based on a phosphate core (reads on claims 3, 4, 6, 15, 16 and 18).

The selections of one hydrocarbyl-substituted cyclo(pentane, pentene, pentadiene) or derivative versus any other hydrocarbyl-substituted cyclo(pentane, pentene, pentadiene) or derivative would have been obvious to one of ordinary skill in the art barring a showing of criticality of one compound over the others (i.e. the various compounds are deemed to be equivalents to each other in the field of lubrication).

In addition, the examiner would like to remind the applicants that the replacement of material with another material known in the art to solve the same problem (e.g. lubrication) is not grounds for patentability, per se. When forming a *prima facie* case of obviousness, the substitution of equivalents requires no express motivation as long as the prior art recognizes the equivalency. In the instant case, hydrocarbyl-substituted cyclo(pentane, pentene, pentadiene) compounds and fluorinated compounds are equivalents in the field of lubricants. *In re Fount* 213 USPQ 532 (CCPA 1982); *In re Siebentritt* 152 USPQ 618 (CCPA) 1967; *Graver Tank & Mfg. Co. Inc. v. Linde Air Products Co.* 85 USPQ 328 (USSC 1950).

Regarding claims 13 and 31, Ng discloses a protective layer for the magnetic recording (col. 11, lines 58-63).

Regarding claim 25, it is old in the art to place a lubricant layer on a magnetic head (see Baum et al., paragraph 9 above).

The added limitations in claims 26-30 were given no weight in patentability for the reasons cited above (paragraph 8).

Regarding claims 32-35, Venier et al. (023) teach that the lubricant can include encompassing additives (col. 7, line 62 bridging col. 8, line 25).

Regarding claims 36 and 37, Venier et al. (023) teach that one can

> mix the type of lubricants used depending on the desired end use (col. 8, line 15-25) and it is deemed that the composition of a mixture of lubricants is a cause-effective variable. It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable such as the composition of the lubricant mixture through routine experimentation in the absence of a showing of criticality in the claimed mixture compositions. *In re Boesch,* 205 USPQ 215 (CCPA 1980), *In re Woodruff,* 16 USPQ2d 1934, 1936 (Fed. Cir. 1990).

Office Action of March 12, 2001, pages 7-11.

Applicants have reviewed the above references and respectfully disagree that the above references, singularly or in combination, render claims 1-37 as amended obvious. Applicants' reasons are stated as follows.

A. Applicable Law

To reject claims of an application under 35 U.S.C. § 103(a), an examiner has the burden of establishing an unrebutted *prima facie* case of obviousness. *See In re Deuel*, 51 F.3d 1552, 1557, 34 U.S.P.Q.2d 1210, 1214 (Fed. Cir. 1995). In the absence of a proper *prima facie* case of obviousness, an applicant who complies with the other statutory requirements is entitled to a patent. *See In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992). Obviousness cannot be established by modifying or combining the teaching of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the modification or combination. See *In re Geiger*, 815 F.2d 686, 688, 2 U.S.P.Q.2d 1276, 1278 (Fed. Cir. 1987). Furthermore, the motivation to modify or combine the teachings of the prior art must be identified in making and sustaining an obviousness rejection. *See In re Rouffet,* 149 F.3d 1350, 47 U.S.P.Q.2d 1453 (Fed. Cir. 1998) (reversing an obviousness rejection for lack of identification by the Examiner and the Board of motivation to combine prior art references). Where cited references, alone or in combination, do not suggest or teach the claimed invention, no *prima facie* case of obviousness has been established and such obviousness rejection is improper. *In re Fine*, 5 U.S.P.Q.2d 1596, 1599 (Fed. Cir. 1988); *In re Evanega*, 829 F.2d 1110, 4 U.S.P.Q.2d 1249 (Fed. Cir. 1987) (reversing an obviousness rejection because the prior art did not teach a claimed limitation). In other words, the absence of a suggestion to combine in the prior art references is dispositive of an obviousness determination. *See Gambro Lundia AB v. Baxter Healthcare Corp.*, 110 F.3d 1573, 1578-79, 42 U.S.P.Q.2d 1378, 1383 (Fed. Cir. 1997).

B. Application of the Law

Presently pending claims 1-24 and 32-37 are directed to a magnetic recording medium having (a) a support; (b) a layer on the support; and (c) a lubricant layer. Presently pending claim 25 is directed to a magnetic head having (a) a head and (b) a lubricant layer. Presently pending claims 26-28 are directed to a data/storage retrieval device having (a) a magnetic recording medium including a magnetic layer over a support and a lubricant layer over the magnetic layer; and (b) a magnetic head. Presently pending claim 29 is directed to a computer comprising (a) a CPU; (b) a disk drive;

(c) a magnetic recording medium including a magnetic layer over a support and a lubricant layer over the magnetic layer; and (d) a magnetic head. Presently pending claim 30 is directed to a method of manufacturing a magnetic recording medium comprising (a) providing a non-magnetic support; (b) forming a magnetic layer on the support; and (c) forming a lubricant layer over the magnetic layer. In all of the presently pending claims, the lubricant layer contains a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, a hydrocarbyl-substituted cyclopentadiene, or a mixture thereof. The claimed hydrocarbyl substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, and hydrocarbyl-substituted cyclopentadienes may also include at least one functional group selected from hydroxy, carboxylic acid, amine, carboxylic amide, phosphate, and sulfur-containing group. The claims as amended do not include functional groups containing fluorine.

Ng discloses amphiphilic compounds that may be used as lubricants which have one of the following structures:

$$(X–T)_m–A–Y_m \text{ and } (X–T)_n–R–(T–A)_n.$$

wherein X is a fluorocarbon terminal group. Ng, column 2, lines 11-22. All of the compounds disclosed in Ng must be fluorinated. Examples of exemplary fluorocarbons are defined at column 2, line 61 - column 4, line 1 and include branched or straight chain "perfluoroalkyl moieties." Ng, column 2, lines 54-61. Because all of the compounds disclosed in the Ng reference are fluorinated, Ng fails to teach, suggest, or disclose the presently claimed hydrocarbyl substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, and hydrocarbyl-substituted cyclopentadienes. In fact, the Examiner has conceded this fact:

> Ng fails to disclose using the exact hydrocarbyl substituted cyclo(pentane, pentenes, pentadienes) compounds claimed by the applicants.

Office Action of March 12, 2001, page 7, emphasis added.

The Venier Article discloses multiply-alkylated cyclopentane fluids. Venier Article, page 586, column 1. The Venier Patent discloses hydrocarbon substituted cyclopentanes, cyclopentadienes and cyclopentenes which may be used as lubricating compositions. Venier Patent, column 3, lines 47-61. The cyclopentanes, cyclopentadienes and cyclopentenes disclosed in both the Venier Article and the Venier Patent are substituted with hydrogen atoms and carbon atoms only.

Although the Venier Article and the Venier Patent disclose hydrocarbon substituted cyclopentanes, cyclopentadienes and cyclopentenes which may be used as lubricating compositions, Applicants respectfully disagree with the Examiner's assertion that it would have been obvious to one of ordinary skill in the art at the time of Applicants' invention to modify the fluorinated compounds in Ng to include the hydrocarbyl-substituted cyclopentanes, cyclopentadienes and cyclopentenes disclosed in the Venier Article and the Venier Patent. Obviousness cannot be established by modifying or combining the teaching of the prior art to produce the claimed invention, absent some teaching, suggestion or incentive supporting the modification or combination. See *In re Geiger*, 815 F.2d 686, 688, 2 U.S.P.Q.2d 1276, 1278 (Fed. Cir. 1987). Here, there is no teaching, suggestion or motivation to modify the fluorinated compounds in Ng by substituting therefor the non-fluorinated hydrocarbyl-substituted cyclopentanes, cyclopentadienes and cyclopentenes disclosed in the Venier Article and the Venier Patent. Hence, Applicants respectfully submit that Ng, the Venier Article, and the Venier Patent, singularly or in combination, do not render the claimed invention as amended obvious.

Furthermore, Applicants respectfully submit that the presently claimed invention is not rendered obvious by the addition of the references cited on pages 8-10 of the Office Action to the Ng-Venier Article-Venier Patent combination made by the Examiner. The references which have been cited on pages 8-10 disclose, *inter alia*, various lubricants and various substitutions of 5-membered ring structures. Again, however, there is no teaching or suggestion in any of the references cited on pages 8-10 which would motivate one skilled in the art to modify the fluorinated compounds in Ng by substituting therefor any of the compounds disclosed in the references on pages 8-10. Without such a teaching, suggestion or motivation to the make this suggested combination, Applicants respectfully submit that the claimed invention is not rendered obvious by the addition of the references on pages 8-10 to the Ng-Venier Article-Venier Patent

combination.

Since the cited references, alone or in combination, do not suggest or teach the claimed invention, Applicants respectfully submit that no *prima facie* case of obviousness has been established. Applicants, therefore, respectfully request that the obviousness rejection be withdrawn.

CONCLUSION

For the above reasons, Applicants respectfully submit that all pending claims, *i.e.*, claims 1-37, are patentable over the prior art. Applicants have addressed all of the Examiner's rejections. In conjunction with the claim amendments and arguments above, Applicants believe that the claims are now in condition for allowance and respectfully request that the Examiner grant such an action. If any questions or issues remain in the resolution of which the Examiner feels will be advanced by a conference with the Applicants' attorney, the Examiner is invited to contact the attorney at the number noted below.

No fees are due as a result of this Reply. The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment, to Deposit Account No. 10-0447, reference 42053.6USPT(BAI).

Respectfully submitted,

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#6

APPENDIX A

MARKED UP VERSION OF SPECIFICATION AND CLAIMS

U.S. APPLICATION SERIAL NO. 09/534,282

IN THE SPECIFICATION

The paragraph beginning at page 4, line 1 has been amended as follows:

In addition to chemical stability, a major challenge in developing disk lubricant systems is to provide adequate durability without increasing stiction to unacceptable levels. During the lifetime of a magnetic disk, the disk head goes through thousands stop-and-start cycles. If the static friction forces between the disk head and the magnetic medium become [becomes] too large, the drive motor may not develop sufficient torque to restart disk spinning. This may lead to failure of the disk drive.

The paragraph beginning at page 4, line 7 has been amended as follows:

As mentioned above, PFPEs have been used extensively to form a lubricant film in a magnetic recording medium. PFPEs are relatively expensive. Therefore, cheaper alternatives are more desirable. Although PFPEs have good thermal stability, they decompose readily when they are in contact with Lewis acids. This is an important consideration because the head often is fabricated from an Al_2O_3/TiC [Al_2O_3/TiC] composite, and Al_2O_3 can be converted to AlF_3, a strong Lewis acid. This formation of AlF_3 leads to chemical degradation of PFPE lubricants. Moreover, use of chlorofluorohydrocarbons ("CFCs") as solvent generally is involved when PFPEs are applied to a magnetic medium. CFCs have detrimental effects on the ozone layer, and use thereof should be avoided, if possible.

The paragraph beginning at page 7, line 14 has been amended as follows:

Since a lubricating film on a magnetic recording medium is exposed to atmospheric conditions and is applied only once during the manufacturing process, the lubricant in the form of a film over a magnetic recording medium preferably should have low vapor pressure, high chemical stability, [and] good load-carrying capability, and desirable tribological properties. Substituted cyclopentanes, cyclopentenes, and cyclopentadienes possess the requisite properties for use as a lubricant film or layer in a magnetic recording medium. Some

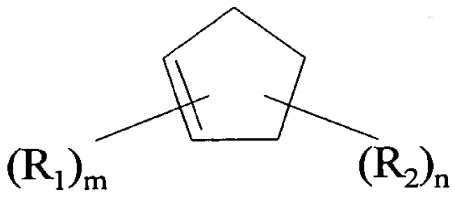
embodiments utilize oligomeric cyclopentane, cyclopentene, and cyclopentadiene derivatives prepared by reacting cyclopentadienes or alkyl-substituted cyclopentadienes with polyhydric alcohols followed by hydrogenation, if appropriate.

The paragraph beginning at page 7, line 24 has been amended as follows:

As mentioned above, suitable compounds for forming a lubricant layer or film over a layer of magnetic material include [includes] hydrocarbyl-substituted cyclopentanes, hydrocarbyl-substituted cyclopentenes, hydrocarbyl-substituted cyclopentadienes, and mixtures or derivatives thereof. These compounds are selected because they have low vapor pressure and desired tribological properties. For example, tris-(2-octyldodecyl) cyclopentane has a vapor pressure of about 1×10^{-12} Torr at about 20°C. Its tribological properties are better or comparable to some of the existing lubricants for magnetic recording media. In addition, it has good thermal stability, additive solubility, and oxidation resistance.

The paragraph beginning at page 8, line 14 has been amended as follows:

Suitable hydrocarbyl-substituted cyclopentenes generally have the following formula:



where R_1 and R_2 are hydrocarbyl groups, respectively, m and n are zero or positive integers, respectively. Preferably, the sum of m and n should be less than 6, although compounds with m+n exceeding six are also suitable in embodiments of the invention. It should be understood that the double bond can be located anywhere [any where] in the ring. Furthermore, either or both R_1 and R_2 may be further derivatized to include any polar groups.

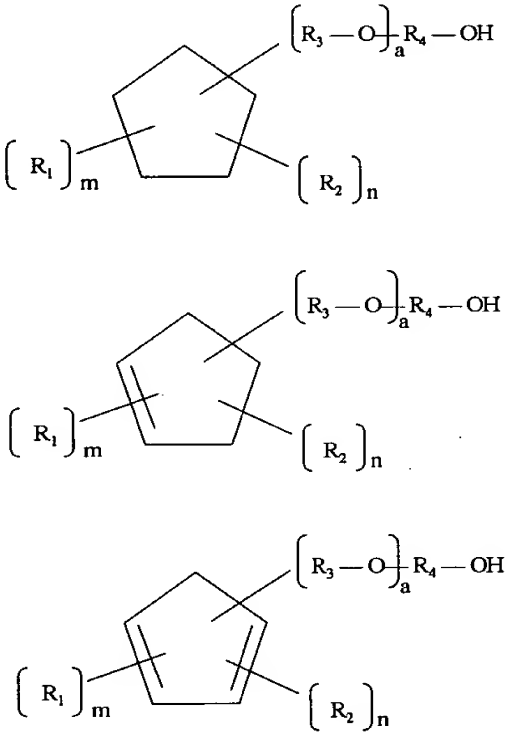
The paragraph beginning at page 10, line 5 has been amended as follows:

Preferably, m is 0, 1, [0,1,] 2, or 3, although it may be any other positive integers. Preferably, n is an integer ranging from two to six, although it may be 0 or any other positive

integers. Preferably, the sum of m and n should not be greater than six, although compounds with m+n exceeding six are also suitable in embodiments of the invention.

The paragraph beginning at page 12, line 10 has been amended as follows:

For example, a cyclopentane, cyclopentene, or cyclopentadiene which includes a polyether or a hydroxyl group may be represented by the following formulas:

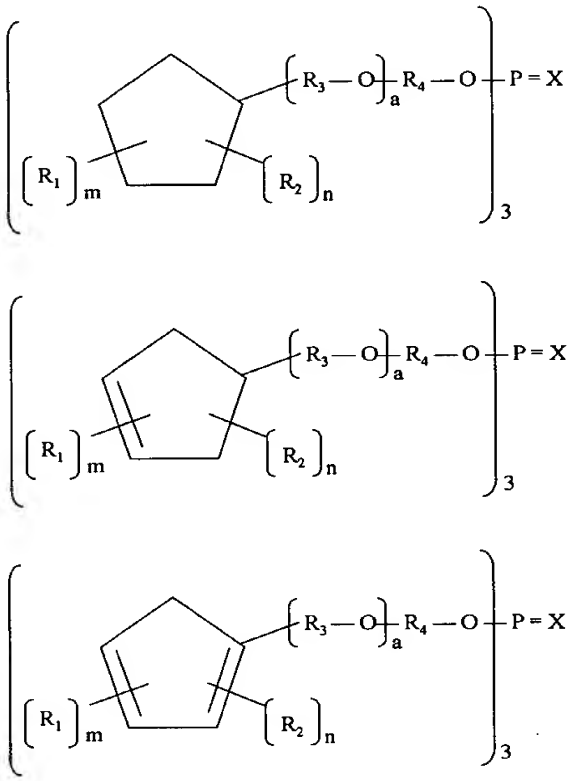


wherein a is any integer, such as 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n can be zero or any positive integers[;]. Preferably, the sum of m and n should be less than 5, although compounds with m+n exceeding five are also suitable in embodiments of the invention. R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group, which may or may not include a polar group.

The paragraph beginning at page 13, line 7 has been amended as follows:

A cyclopentane, cyclopentene, or cyclopentadiene which includes a phosphate or

thiophosphate group may be represented by the following formulas:

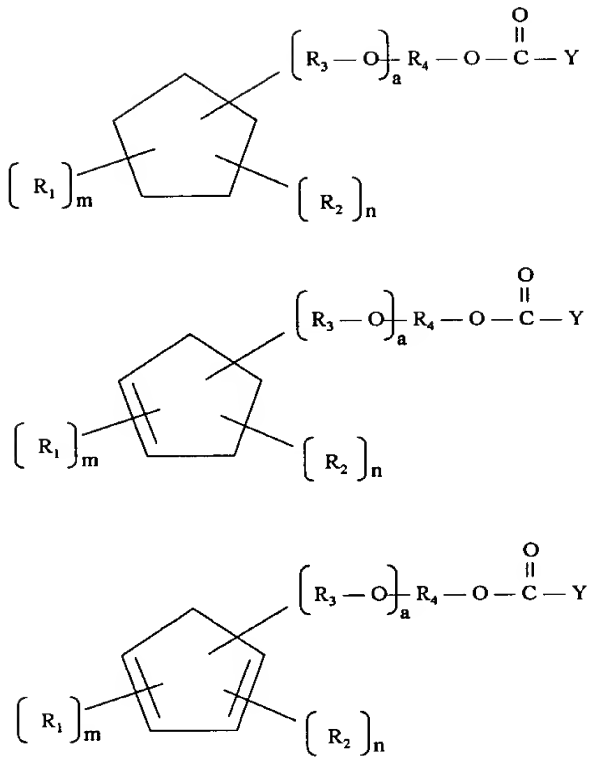


wherein a is any integer, such as 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n can be zero or any positive integers[;]. Preferably, the sum of m and n should be less than 5, although compounds with m+n exceeding five are also suitable in embodiments of the invention. R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group, which may or may not include a polar group; X is either oxygen or sulfur.

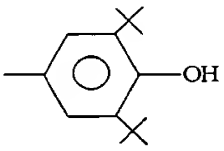
The paragraph beginning at page 14, line 6 has been amended as follows:

A cyclopentane, cyclopentene, or cyclopentadiene which includes a carboxylic acid, ester, phenolic ester, or amide group may be represented by the following formulas:

APPENDIX A



wherein a is any integer, such as 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n can be zero or any positive integers[;]. Preferably, the sum of m and n should be less than 5, although compounds with m+n exceeding five are also suitable in embodiments of the invention. R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group, which may or may not include a polar group; Y may be

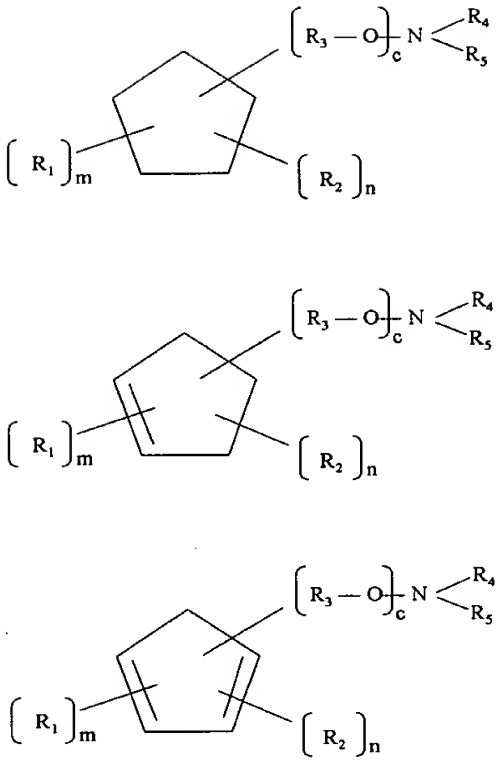


-OH; -$NH_{2[,]}$; and -$(CF_2)_b$-F (in which b is 1, 2, 3, ..., or 20).

The paragraph beginning at page 15, line 7 has been amended as follows:

A cyclopentane, cyclopentene, or cyclopentadiene which includes an amine group may be represented by the following formulas:

APPENDIX A

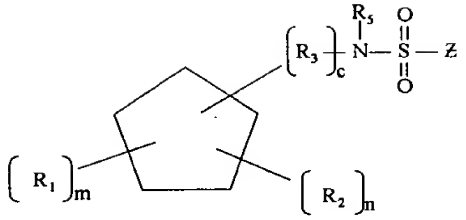


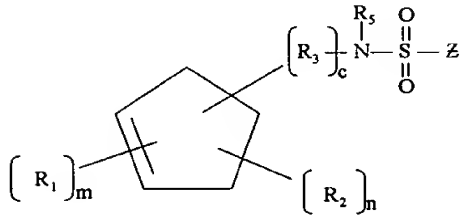
wherein c is any integer, such as 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n can be zero or any positive integers[;]. Preferably, the sum of m and n should be less than 5, although compounds with m+n exceeding five are also suitable in embodiments of the invention. R_1, R_2, R_3, R_4, and R_5 are individually a hydrocarbyl group, which may or may not include a polar group; R_4[,] and R_5 may also be hydrogen individually.

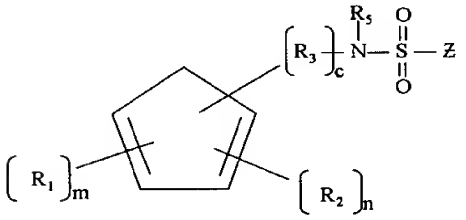
The paragraph beginning at page 16, line 7 has been amended as follows:

A cyclopentane, cyclopentene, or cyclopentadiene which includes a sulfonamide group may be represented by the following formulas:

APPENDIX A







wherein c is any integer, such as 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n can be zero or any positive integers[;]. Preferably, the sum of m and n should be less than 5, although compounds with m+n exceeding five are also suitable in embodiments of the invention. R_1, R_2, R_3, and R_5 are individually a hydrocarbyl group, which may or may not include a polar group; R_5 may also be hydrogen; Z may be a hydrocarbyl group or $-(CF_2)_b-F$ (in which b is 1, 2, 3, ..., or 20).

The paragraph beginning at page 20, line 13 has been amended as follows:

Tris(2-octyldodecyl)cyclopentadiene (18.12 grams, 20 m mol) was placed in a 3-necked round bottom flask equipped with an additional funnel, a gas inlet adapter, and a septum. After flashing with dried N_2 for 2 minutes, [50ml] <u>50 ml</u> of dried THF (distilled over K) was added. The solution was cooled in dry ice/acetone bath, followed injected 8.4 M n-

butyl lithium in hexane solution (2.40 ml; 20 m mol). The dry ice/acetone bath was removed, and the resulting dark red solution was stirred at room temperature for 1 hour, followed by cooling in dry ice/acetone bath. 3-Bromopropionitrile (2.70 grams, 20 m mol) in 10 ml dried THF solution was then dropwise added from the additional funnel. After the addition, the reaction solution was stirred at room temperature for another 3 hours. The reaction was slowly quenched with 10 ml water. The organic layer was separated, and the aqueous layer was extracted with 50 ml hexane. The organic layers were combined, dried over $MgSO_4$, filtered, and rota-vaporized to give 19.6 grams of yellow liquid. The crude reaction product was purified by column chromatography on SiO_2 eluting with 5% ethyl acetate/hexane. The unreacted tris(2-octyldodecyl)cyclopentadiene (3.66 grams) was recovered and the title compound (12.83 grams) was isolated. FTIR: 2248 cm^{-1} (C≡N); ^{13}C [^{13} C] NMR (4 isomers): 152.5-129.1 ppm (C=C), 120.8-119.6 ppm (4 peaks; C≡N), 59.5 ppm, 56.9 ppm, 51.3 ppm, 41.1 ppm, 39.5-26.4 ppm, 22.7ppm, 14.1ppm

The paragraph beginning at page 21, line 23 has been amended as follows:

To a stirring solution of 3-[tris(2-octyldodecyl)cyclopentadienyl] propionitrile (8.38 grams; 9.23 m mol) in 20 ml of dried THF was slowly added 1 M lithium alumina hydride in THF solution (9.3 ml) at 0° C. After the addition, the ice bath was removed. The reaction was further stirred at room temperature for 2 hours. The reaction was slowly quenched with 10 ml of water. The reaction mixture solution was extracted with hexane (2X 20 ml). The organic layer was dried over $MgSO_4$, filtered, and rota-vaporized to yield 8.13 grams, which were further purified by column chromatography on SiO_2 eluting with 40% ethyl acetate/hexane to yield 5.21 grams of the title compound[:]. FTIR: 3392 cm^{-1}, 1618 cm^{-1}, 1074 cm^{-1}, 786 cm^{-1}, and 721 cm^{-1} (no C≡N at 2248 cm^{-1} was present). ^{1}H NMR: δ 2.66 (2H); δ 1.28; and δ 0.90 (t, 18H).

The paragraph beginning at page 22, line 13 has been amended as follows:

Tris(2-octyldodecyl)cyclopentadiene (18.12 grams, 20 m mol) was placed in a 3-necked round bottom flask equipped with an additional funnel, a gas inlet adapter, and a septum. After flashing with dried N_2 for 2 minutes[;], 50 ml of dried THF was added. The

solution was cooled in a dry ice/acetone bath, followed by injecting 8.4 M n-butyl lithium in hexane solution (2.40 ml; 20 m mol). The dry ice/acetone bath was removed, and the resulting dark red solution was stirred at room temperature for 1 hour, followed by cooling in a dry ice/acetone bath. The above tetrahydropyranyl derivative of 2-(2-chchloethoxy)ethanol (4.45 grams, 20 m mol) in 10 ml dried THF was then dropwise added from the additional funnel. After the addition, the reaction solution was stirred overnight at room temperature under N_2. The reaction was slowly quenched with 20 ml water. The organic layer was separated, and the aqueous layer was extracted with 50 ml hexane. The organic layers were combined, dried over $MgSO_4$, filtered, and rota-vaporized to give 21.65 grams of liquid. To the liquid was added 20 ml of methylene dichloride and 0.2 ml of concentrated HCl to de-protect the hydroxy group. The reaction mixture was stirred overnight, followed by aqueous work-up to give 19.27 grams of a crude product. The title compound (16.90 grams) was obtained after purification by column chromatography on SiO_2, eluting with 5% ethyl acetate/hexane. FTIR: 3471[-cm $^{-1}$] cm $^{-1}$, 3050[-cm $^{-1}$] cm $^{-1}$, 1647[-cm $^{-1}$] cm $^{-1}$, 1618 cm $^{-1}$, 1058 cm $^{-1}$. ^{13}C NMR (2 isomers): 150.7 ppm, 148.4 ppm, 145.1 ppm, 142.6 ppm, 139.3 ppm, 126.7 ppm, 122.9 ppm, 121.9 ppm, 71.8 ppm, 68.8 ppm, 61.9 ppm, 47.8-26.5 ppm, 22.7 ppm, and 14.1 ppm.

The paragraph beginning at page 23, line 9 has been amended as follows:

The hydrogenation of 2-[2-tris(2-octyldodecyl)cyclopentadienyl]-ethoxy ethanol [2-[2-tris(2-octyldodecyl)cyclopentadienyl-ethoxy] ethanol] was carried out in a similar manner as described in Example 2, except the catalyst used was rhodium on alumina.

The paragraph beginning at page 23, line 12 has been amended as follows:

2-[2-tris(2-octyldodecyl)cyclopentadienyl]-ethoxy ethanol [2-[2-tris(2-octyldodecyl)cyclopentadienyl-ethoxy] ethanol] (20 grams), rhodium (5% Rh) on alumina (1 gram), and 250 ml of heptane were placed in a 500 ml Zipper Clave reactor. The hydrogenation was maintained at 950 psi H_2 and 280° C for 24 hours. The title compound was further purified by column chromatography on SiO_2, eluting with 5% ethyl acetate/hexane, to give 18.59 gram of colorless liquid. FTIR: 3471 cm $^{-1}$, 1120 cm $^{-1}$, 1058 cm $^{-1}$, 890 cm $^{-1}$, 721 cm $^{-1}$. ^{1}H NMR: d 3.70 (1H), d 3.52 (1H), d 3.46 (1H), d 1.25, d 0.87. ^{13}C

NMR: 71.8 ppm, 70.5 ppm, 61.9 ppm, 52.8-33.7 ppm, 31.9 ppm, 30.3 ppm, 29.8 ppm, 29.5 ppm, 26.7 ppm, 22.7 ppm, and 14.1 ppm.

The paragraph beginning at page 23, line 22 has been amended as follows:

2-[2-tris(2-octyldodecyl)cyclopentyl]-ethoxy ethanol [2-[2-tris(2-octyldodecyl)cyclopentyl] ethoxy ethanol] (8.0 grams, 8.35 m mol), 3,5-di-tert-butyl-4-hydroxybenzoic acid (2.94 grams, 12.6 m mol), and a catalytic amount of p-toluenesulfonic acid in 60 ml toluene were refluxed in a Dean-Stark trap. The reaction was monitored by TLC until all 2-[2-tris(2-octyldodecyl)cyclopentyl]-ethoxy ethanol [2-[2-tris(2-octyldodecyl)cyclopentyl] ethoxy ethanol] was consumed. It took 4 days to complete the reaction. The reaction solution was washed with 1M aqueous K_2CO_3 (2 X 20 ml). After being dried, filtered, and rota-vaporized, the crude reaction product was chromatographed on SiO_2, eluting with 3% ethyl acetate/hexane to yield about 9.87 grams of the pure title compound. The pure title compound was characterized by the following: FTIR: 3635 cm^{-1}, 1718 cm^{-1}, 1600 cm^{-1}. ^1H NMR: d 7.92 (s, 2H), d 5.63 (s, 1H), d 4.44 (t, 2H), d 3.74 (t, 2H), d 3.53 (m, 2H), d 1.44 (s, 18H), d 1.22 (br. s.) , d 0.91 (t, 18H). ^{13}C NMR: 167 ppm, 158.2 ppm,135.6 ppm, 127.2 ppm, 121.2 ppm, 68.1 ppm, 64.0 ppm, 45.1 ppm, 34.3 ppm, 31.9 ppm, 30.2 ppm, 30.1 ppm, 29.8 ppm, 29.4 ppm, 22.7 ppm, 14.1 ppm.

The paragraph beginning at page 27, line 5 has been amended as follows:

Generally, any non-magnetic materials may be used as a substrate support. Suitable materials for the support include, but are not limited to, a metal such as an aluminum alloy, a titanium alloy, or a stainless steel alloy; plastic such as polyester, polyimide, polyamidoimide, polyethersulfone, polysulfone, aromatic polyether, an epoxy resin, a urea resin, a melamine resin, polycarbonate, a diallylphthalate resin, an acrylic resin, a phenolic resin, polyphenylenesulfide, polyphenyleneether, a polyacetal resin, polybutyreneterephthalate, a bismaleimidetriazine resin, a polyoxybenzylene resin, a polyphenylenesulfide; ceramics such as glass, silicon, germanium, alumina, silica, diamond, amorphous carbon, or graphite; and a metal such as an aluminum alloy coated with anodized aluminum, an Ni-P-plating film, Cr, Fe, Ni [FeNi], stainless steel, Mo or [Or] W. It should be recognized that a non-magnetic support

is not always necessary in manufacturing a magnetic medium.

The paragraph beginning at page 27, line 26 has been amended as follows:

Suitable materials for forming the protective layer between the magnetic layer and the lubricant layer include, but are not limited to, a silicon compound such as SiO_2, Si_3N_4, SiC, or a silicic acid polymer; a metal oxide such as Al_2O_3, CoO, Co_3O_4, Co_2O_3, a-Fe_2O_3, Cr_2O_3, CrO_3, TiO_2, ZrO_2, ZnO, PbO, NiO, MoO_2, or SnO_2; a metal sulfide such as MoS_2, WS_2, or TaS_2; a metal carbide such as TiC, ZrC, CrC, or TaC; a metal fluoride or graphite fluoride; a metal such as W, Cr, Ir, NiB, NiP, FeCr, NiCr, Sn, Pb, Zn, Tl, Au, Ag, Cu, Ga, Ru, Rb, Mn, Mo, Os, or Ta, or an alloy of each of these metals; a semiconductor such as Si, Ge, $B_x[.]$ or C (e.g., amorphous hydrogenated carbon, amorphous nitrogenated carbon, amorphous carbon, diamond-like carbon, or a mixture thereof, or graphite-like carbon or a mixture thereof); and plastic such as polytetrafluoroethylene, a phenolic resin, or polyimide.

The paragraph beginning at page 33, line 12 has been amended as follows:

Lubricant films were made from a solution containing Pennzane® X-2000 at 0.055 wt.%, 0.11 wt.% [0.11wt.%] and 0.22 wt.% and Z-DOL® at 0.1 wt.%, respectively. These films were tested in the HVBOIP tester. Both normal force F_z and frictional force F_x for each film were measured. The coefficient of friction is the ratio of F_x/F_z. Figs. 4 and 5 are plots for two Pennzane® X-2000 lubricant films. In both figures, normal force F_z, frictional force F_x, and coefficient of friction F_x/F_z are plotted as a function of the number of cycles. The coefficient of friction for the Pennzane® X-2000 lubricant film with 0.11 wt.% is about 0.4, whereas the coefficient of friction for the Pennzane® X-2000 lubricant films with 0.22 wt.% is decreased to about 0.25.

IN THE CLAIMS

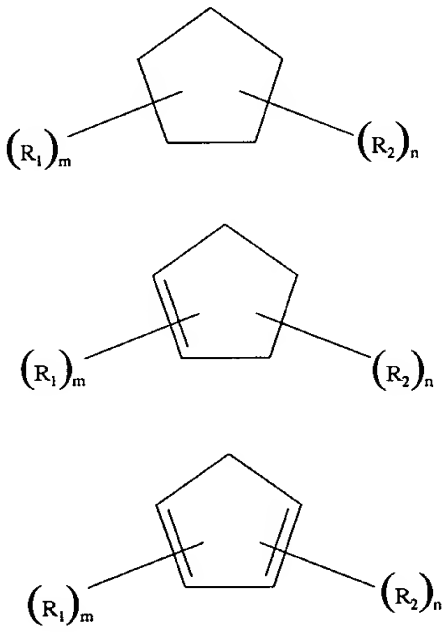
Claims 1-12, 14-26, 29-30, 33, and 35 have been amended as follows:

1. (Once Amended) A magnetic recording medium, comprising:
a non-magnetic support;

a magnetic layer formed on the support; and

a lubricant layer over the magnetic layer, the lubricant layer including a compound selected from the group consisting of hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, hydrocarbyl-substituted cyclopentadiene, and mixtures [or derivatives] thereof.

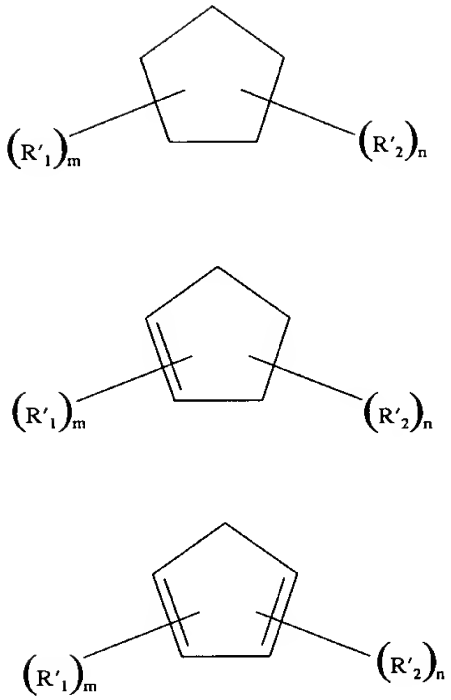
2. (Once Amended) The magnetic recording medium of claim 1, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:



wherein R_1 and R_2 are respectively a hydrocarbyl group, and m and n are respectively zero or a positive integer and the sum of m + n is greater than zero.

3. (Once Amended) The magnetic recording medium of claim 1, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective

formulas:

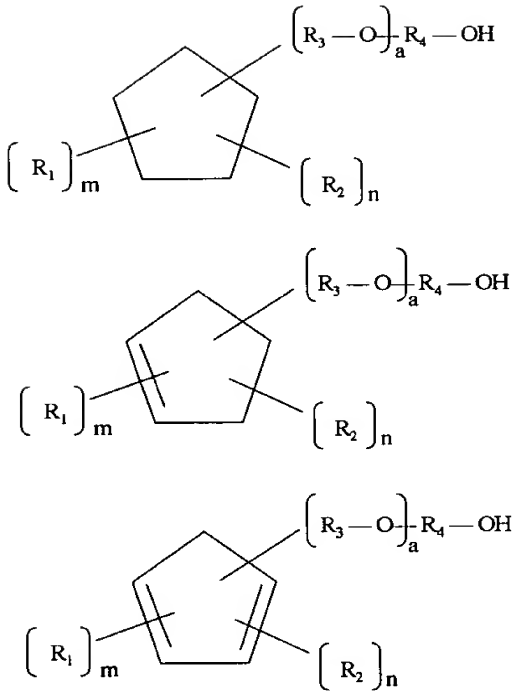


wherein R'_1 and R'_2 are respectively a functionalized hydrocarbyl group which includes a functional group selected from -OH; $-NH_2$; carboxylic acid; carboxylic ester; phenolic ester; polyether; amide; amine; sulfonamide; thiophosphate; and phosphate, and m and n are respectively zero or a positive integer and the sum of m + n is greater than zero.

4. (Once Amended) The magnetic recording medium of claim 1, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene include at least one functional group selected from the group consisting of hydroxy, carboxylic acid, amine, carboxylic ester, carboxylic amide, phosphate, and sulfur-containing groups.

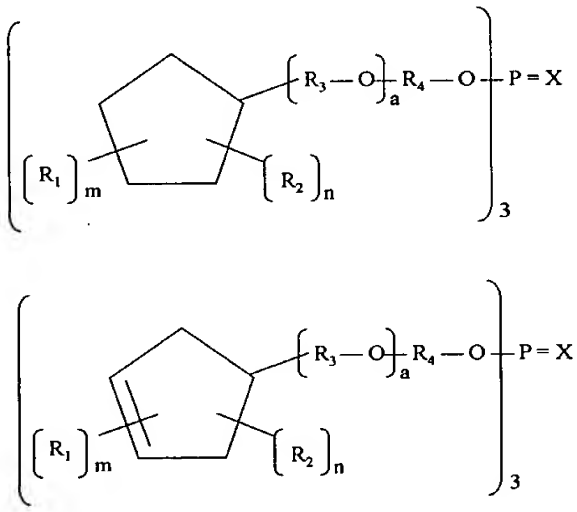
5. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

APPENDIX A

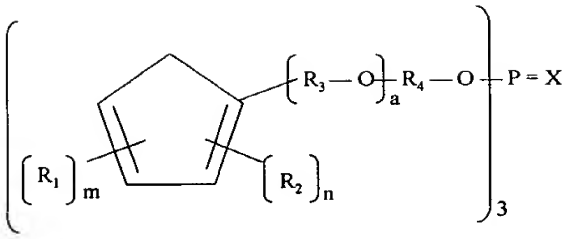


wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group.

6. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

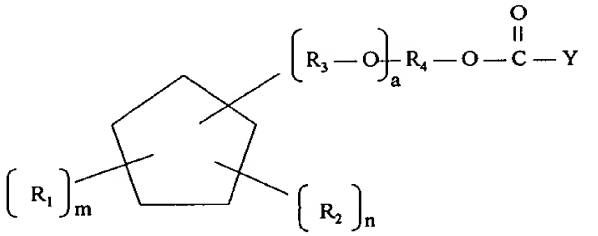


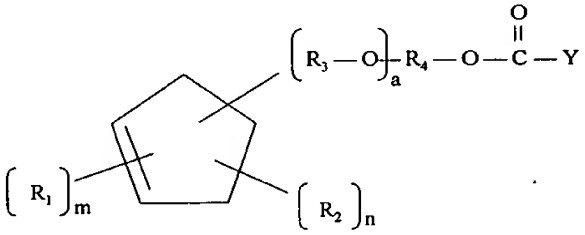
APPENDIX A

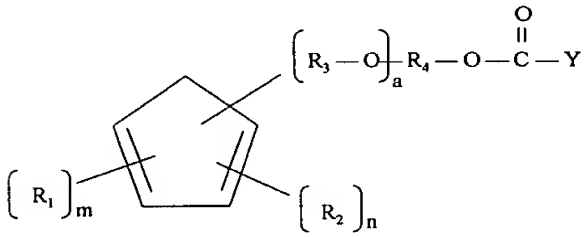


wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group; X is either oxygen or sulfur.

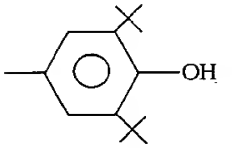
7. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:





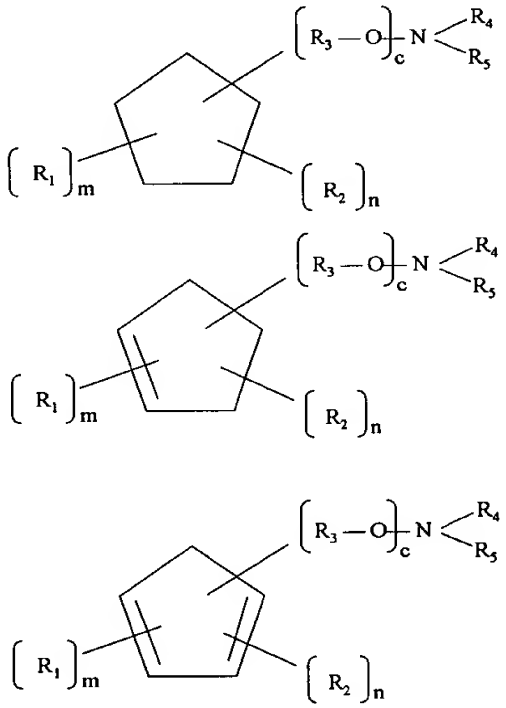


wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group; Y is -OH_x[;] -NH_2, or



[; or -$(CF_2)_b$-F, where b is 1, 2, 3, ..., or 20].

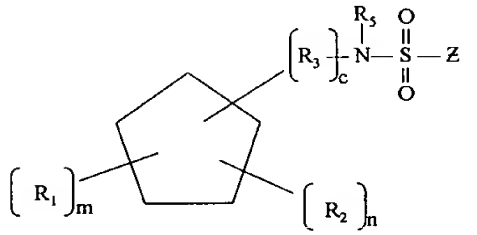
8. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

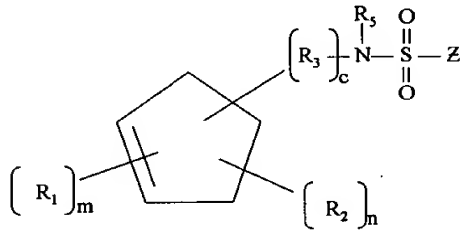


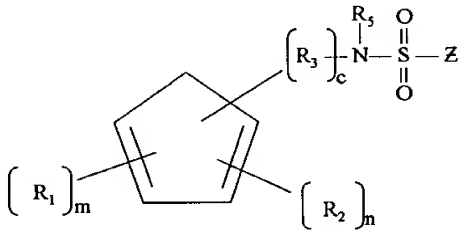
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, and R_3 are individually a hydrocarbyl group; R_4 and R_5 individually are hydrogen or hydrocarbyl.

9. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or

hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

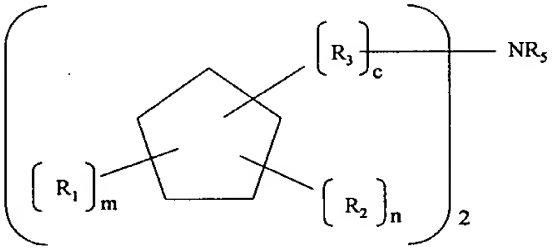


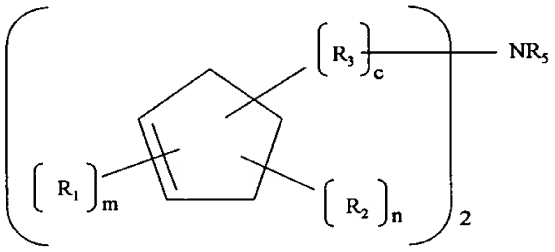


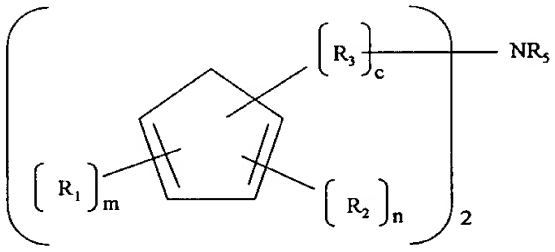


wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, and R_3 are individually a hydrocarbyl group; R_5 is hydrogen or hydrocarbyl; Z is hydrocarbyl [or $-(CF_2)_b-F$ where b is 1, 2, 3, ..., or 20].

10. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:







wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, and R_3 are individually a hydrocarbyl group; R_5 is hydrogen or hydrocarbyl.

11. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

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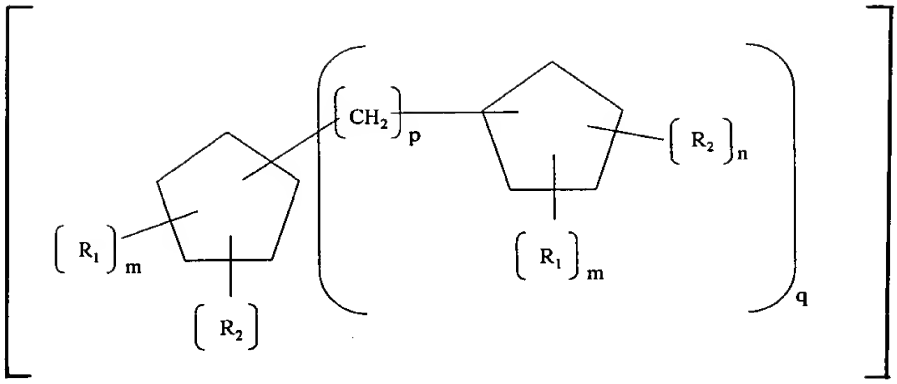
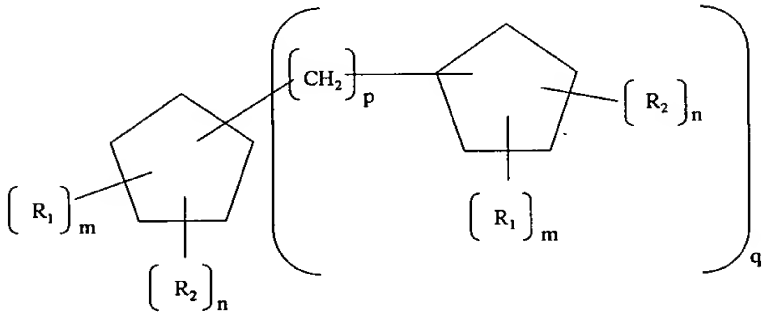
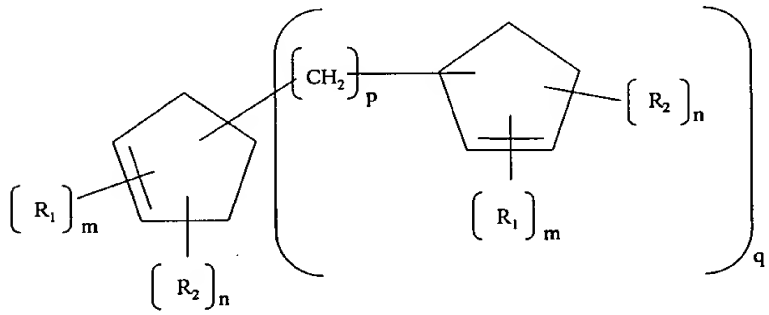
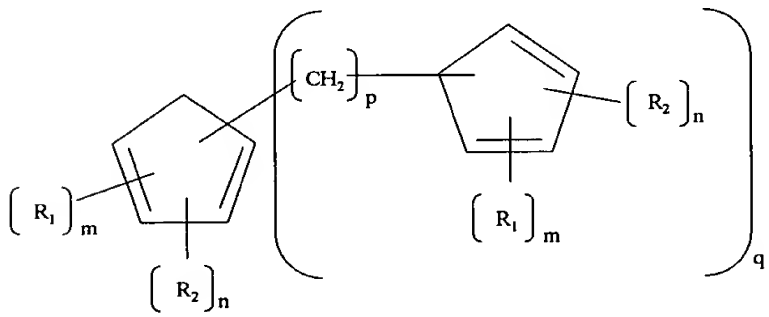


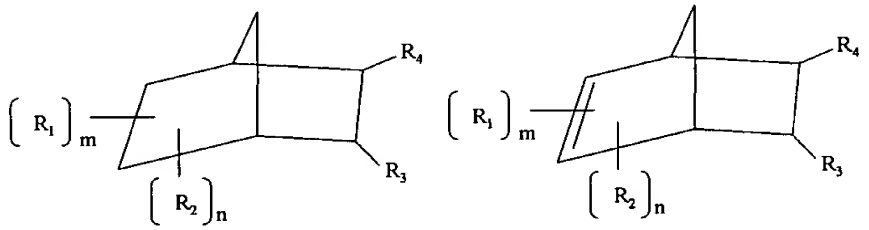






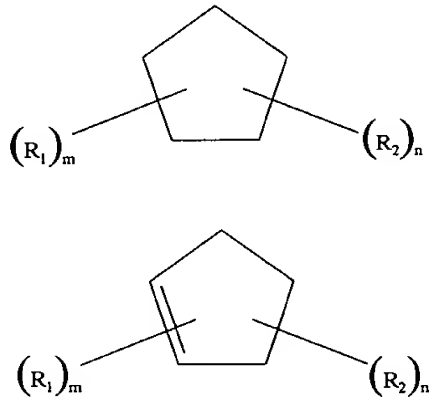
wherein p is 1, 2, 3, ..., or 10; q is 1, 2, 3, ..., or 10; m and n are zero or a positive integer; R_1 and R_2 are individually a hydrocarbyl group.

12. (Once Amended) The magnetic recording medium of claim 4, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



wherein m and n are zero or a positive integers; R_1 and R_2 individually are a hydrocarbyl group; R_3 and R_4 individually are hydrocarbyl, hydroxy, nitrile, carboxylic acid, carboxylic amide, or carboxylic ester.

14. (Once Amended) The magnetic recording medium of claim 13, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:



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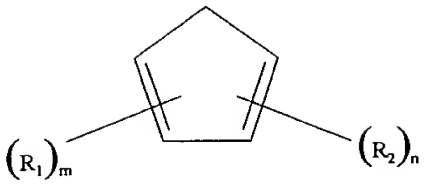
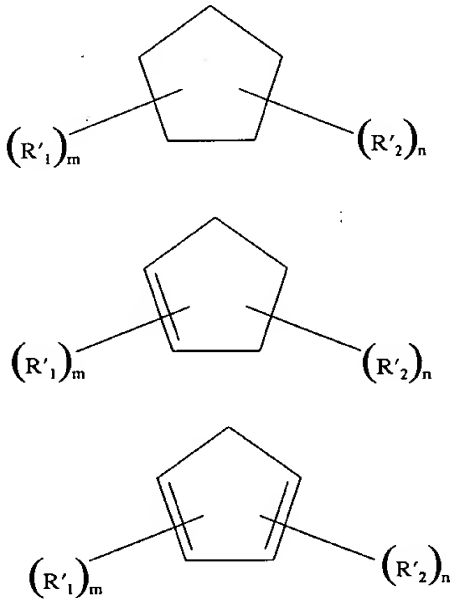


wherein R_1 and R_2 are respectively a hydrocarbyl group, and m and n are respectively zero or a positive integer and the sum of m + n is greater than zero.

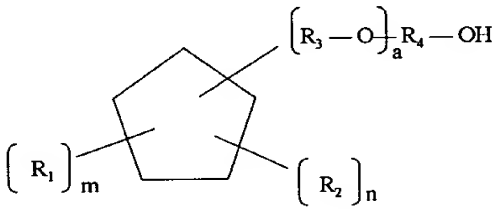
15. (Once Amended) The magnetic recording medium of claim 13, wherein the lubricant layer includes a hydrocarbyl-substituted cyclopentane, a hydrocarbyl-substituted cyclopentene, or a hydrocarbyl-substituted cyclopentadiene as represented by the following respective formulas:

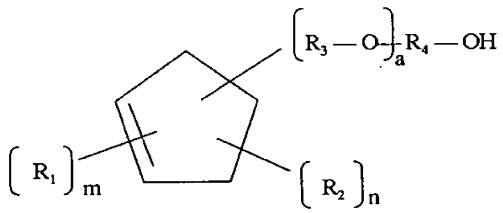


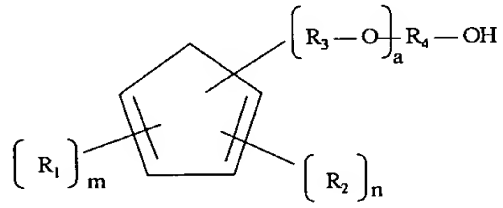
wherein R'_1 and R'_2 are respectively a functionalized hydrocarbyl group which includes a functional group selected from -OH; $-NH_2$; carboxylic acid; carboxylic ester; phenolic ester; polyether; amide; amine; sulfonamide; thiophosphate; and phosphate, and m and n are respectively zero or a positive integer and the sum of m + n is greater than zero.

16. (Once Amended) The magnetic recording medium of claim 13, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene include at least one functional group selected from the group consisting of hydroxy, carboxylic acid, amine, carboxylic ester, carboxylic amide, phosphate, and sulfur-containing groups.

17. (Once Amended) The magnetic recording medium of claim 16, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:







wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group.

18. (Once Amended) The magnetic recording medium of claim 16, wherein the

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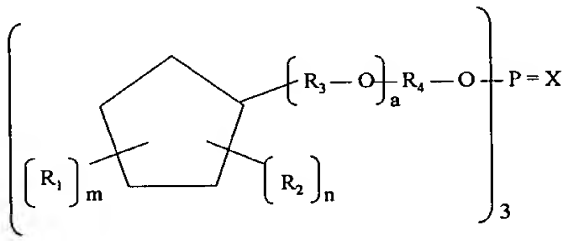
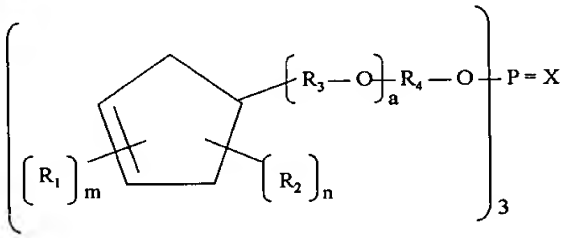
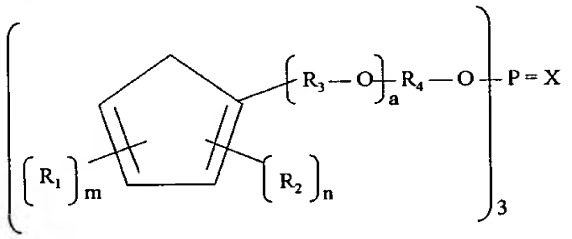
[derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



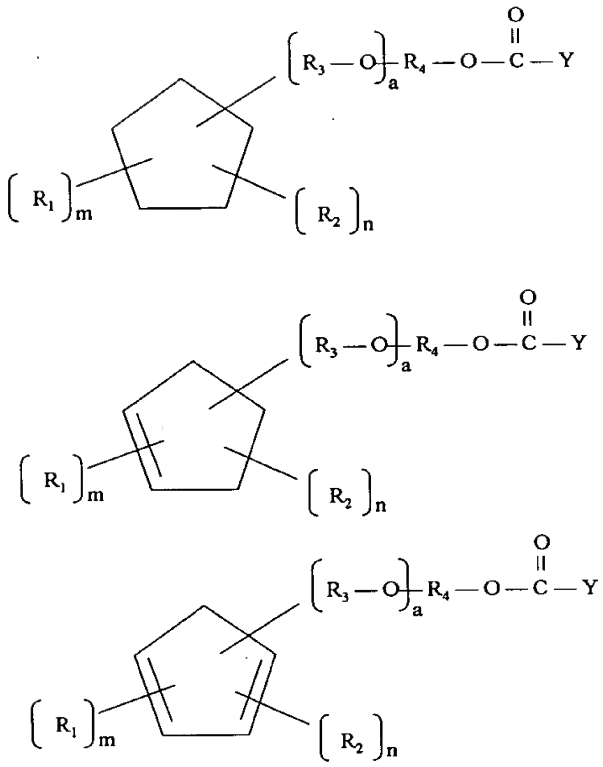




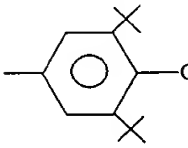
wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group; X is either oxygen or sulfur.

19. (Once Amended) The magnetic recording medium of claim 16, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

APPENDIX A

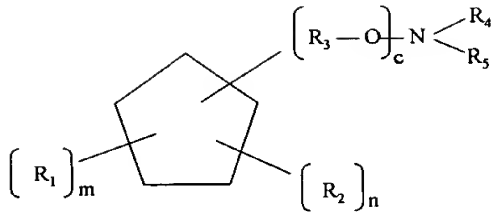


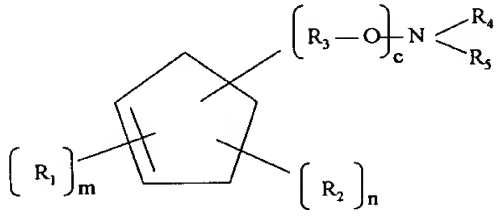
wherein a is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, R_3, and R_4 are individually a hydrocarbyl group; Y is -OH, [;] $-NH_2$, or

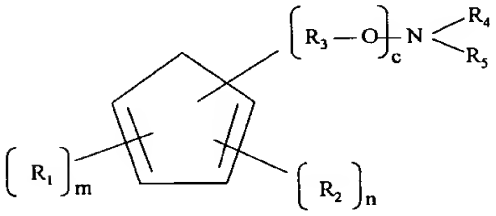

[; or $-(CF_2)_b-F$, where b is 1, 2, 3, ..., or 20].

20. (Once Amended) The magnetic recording medium of claim 16, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:

APPENDIX A

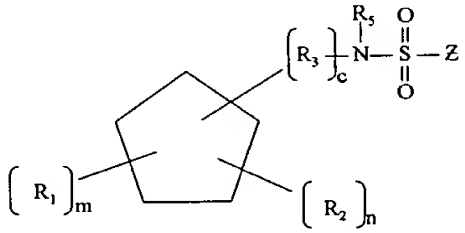




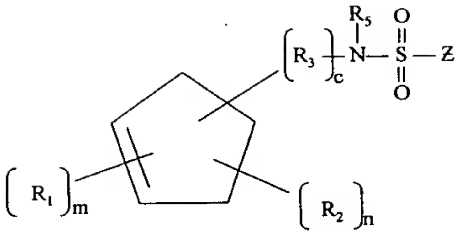


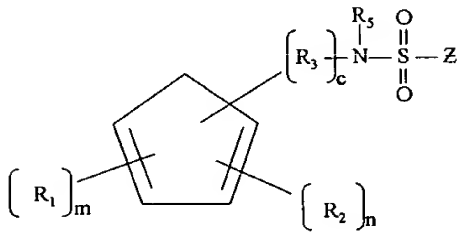
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, and R_3 are individually a hydrocarbyl group; R_4 and R_5 individually are hydrogen or hydrocarbyl.

21. (Once Amended) The magnetic recording medium of claim 16, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



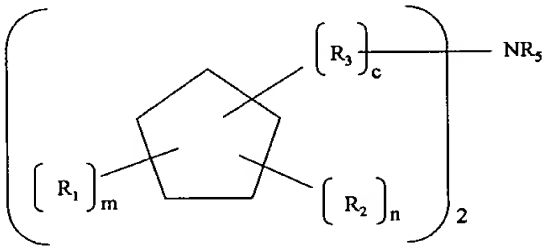
APPENDIX A

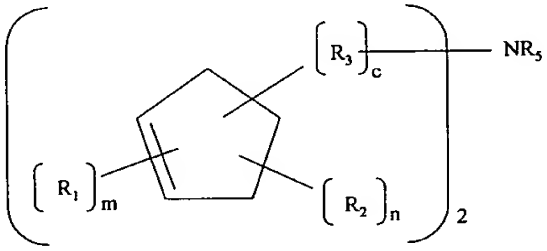




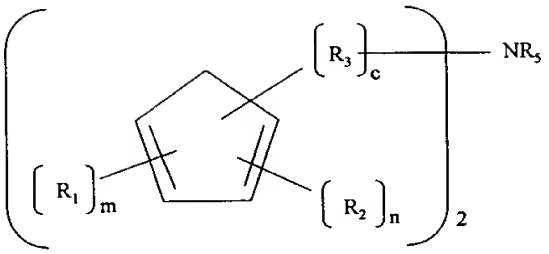
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, and R_3 are individually a hydrocarbyl group; R_5 is hydrogen or hydrocarbyl; Z is hydrocarbyl [or $-(CF_2)_b-F$ where b is 1, 2, 3, ..., or 20].

22. (Once Amended) The magnetic recording medium of claim 16, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



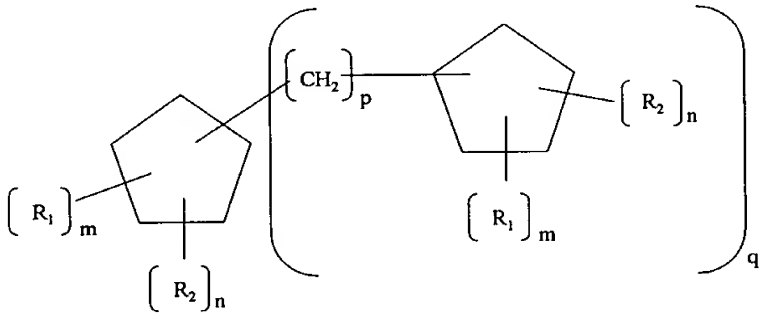


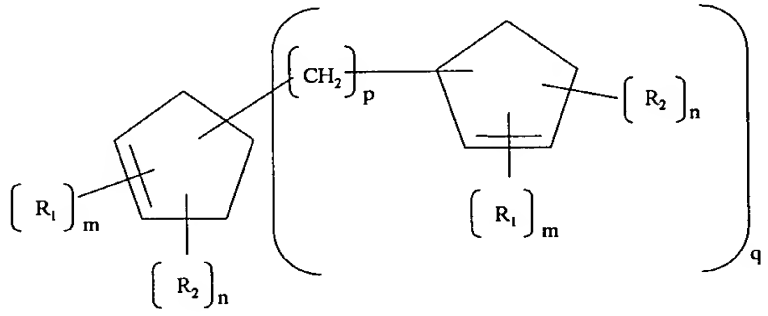
APPENDIX A



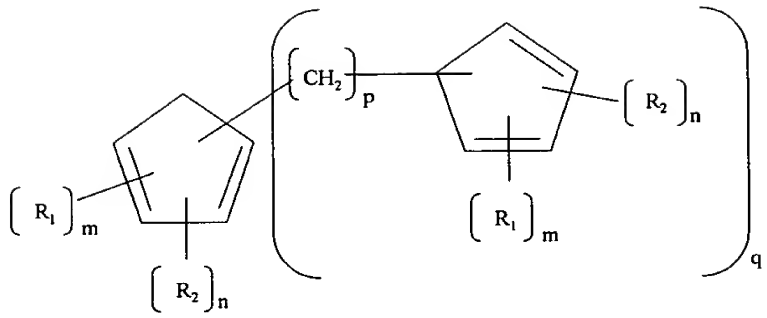
wherein c is 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, or 10; m and n are zero or a positive integer; R_1, R_2, and R_3 are individually a hydrocarbyl group; R_5 is hydrogen or hydrocarbyl.

23. (Once Amended) The magnetic recording medium of claim 16, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



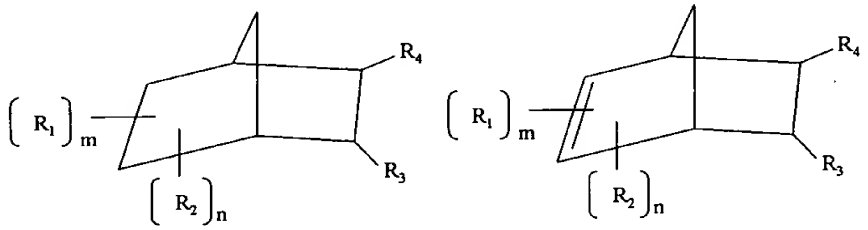


APPENDIX A



wherein p is 1, 2, 3, ..., or 10; q is 1, 2, 3, ..., or 10; m and n are zero or a positive integer; R_1 and R_2 are individually a hydrocarbyl group.

24. (Once Amended) The magnetic recording medium of claim 16, wherein the [derivatives of the] hydrocarbyl-substituted cyclopentane, hydrocarbyl-substituted cyclopentene, or hydrocarbyl-substituted cyclopentadiene are represented by the following respective formulas:



wherein m and n are zero or a positive integers; R_1 and R_2 individually are a hydrocarbyl group; R_3 and R_4 individually are hydrocarbyl, hydroxy, nitrile, carboxylic acid, carboxylic amide, or carboxylic ester.

25. (Once Amended) A magnetic head, comprising:

a head; and

a lubricant layer over at least a portion of the head, the lubricant layer including a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures [or derivatives] thereof.

26. (Once Amended) A data storage/retrieval device, comprising:

a magnetic recording medium including a magnetic layer over a support and a lubricant layer over the magnetic layer, the lubricant layer including a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures [or derivatives] thereof; and

a magnetic head adjacent to the magnetic recording medium, the magnetic head sliding on the magnetic recording medium to read and write information on the magnetic recording medium.

29. (Once Amended) A computer, comprising:

a CPU;

a disk drive connected to the CPU so that the disk drive can communicate with the CPU, the disk drive including:

a magnetic recording medium having a magnetic layer over a support and a lubricant layer over the magnetic layer, the lubricant layer having a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures [or derivatives] thereof; and

a magnetic head adjacent to the magnetic recording medium, the magnetic head sliding on the magnetic recording medium to read and write information on the magnetic recording medium.

30. (Once Amended) A method of manufacturing a magnetic recording medium, comprising:

providing a non-magnetic support;

forming a magnetic layer on the support; and

forming a lubricant layer over the magnetic layer, the lubricant layer including a compound selected from the group consisting of hydrocarbyl substituted cyclopentane, hydrocarbyl substituted cyclopentene, hydrocarbyl substituted cyclopentadiene, and mixtures

[or derivatives] thereof.

33. (Once Amended) The magnetic recording medium of claim 32, the additives are cyclic phosphazenes, metallic soaps, fatty acids, amides, fatty acid esters, higher aliphatic alcohols, monoalkyl phosphates, dialkyl phosphates, trialkyl phosphates, paraffins, silicone oils, animal oils, vegetable oils, mineral oils, higher aliphatic amines, inorganic fine powders, resin fine powders, unsaturated aliphatic hydrocarbons, or a mixture thereof [therefore].

35. (Once Amended) The magnetic recording medium of claim 34, the additives are cyclic phosphazenes, metallic soaps, fatty acids, amides, fatty acid esters, higher aliphatic alcohols, monoalkyl phosphates, dialkyl phosphates, trialkyl phosphates, paraffins, silicone oils, animal oils, vegetable oils, mineral oils, higher aliphatic amines, inorganic fine powders, resin fine powders, unsaturated aliphatic hydrocarbons, or a mixture thereof [therefore].